Exploring Teachers' Pedagogical Approaches and Strategies in Designing Educational Games

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Abstract: This study aims to explore how teachers design their own games and how their perceptions of digital games change after game design. Twenty teachers participated in the study. The participants first completed a pre-survey. Then, they designed an educational digital game on their chosen topic and provided feedback to each other. In the game design process, they did not use computers. A game design template was provided for conceptual design of an educational digital game. Finally, the participants completed a post-survey. Both quantitative and qualitative data were collected from online surveys (pre- and post-surveys) and game design documents. The results of the study showed that most participants applied the constructivist learning approach to the design of educational games. The game design experience had a positive influence on the participants' attitudes toward and perceptions of digital games.

Introduction

Many teachers are unaware or skeptical of the pedagogical value of video games, due in part to their lack of experience with this type of media (Gaudelli & Taylor, 2011; Schrader Zheng, & Young, 2006). Research shows that game design can help teachers better understand game-based learning and afford them opportunities to re-conceptualize pedagogy (Li, 2012). Only a few studies have investigated teachers' game design experiences. This study aims to investigate how teachers design their own games, focusing on their pedagogical approaches and strategies. This study also examines how the game design experience affects their perceptions of educational digital games. Findings from research on teachers' game design show that teachers' limited programming skills or the constraints of game design software often prevented them from implementing their original ideas. Therefore, this study focuses on conceptual design of digital games. The following questions guided our research investigation:

1. What pedagogical approaches and strategies do teachers use for their games?
2. How does game design experience affect teacher perceptions of educational digital games?

Method

The study was conducted in an online graduate course in the College of Education at a public university. This study focused on one of the course assignments which required the students design an educational game on a topic of their choice. Twenty students chose to participate in this study. Of these, 13 (65%) were female and 7 (35%) were male. The participants ranged in age from 20s to 40s. They were all school teachers.

The instructor sent a link to the pre-survey to the participants. Once they completed the pre-survey, the instructor provided them with the instructions for the game design assignment and a game design template. The participants designed an educational digital game on their chosen topic. They did not use computers for the game design. They were engaged in conceptual design using the given template. After submitting their game designs, the participants were asked to provide feedback to the games designed by their classmates and then to complete the post-survey.

We used descriptive statistics, t-tests, and Wilcoxon Signed Rank tests to analyze quantitative data from the pre- and post-surveys. Specifically, the paired-samples t-tests were used to compare pre- and post-survey scores in the following categories: (a) Interest, attitudes, and self-efficacy, (b) Perceived benefits, and (c) Perceived problems. The Wilcoxon Matched Pairs Signed Rank tests were used to compare pre- and post-scores on individual items. We used constant comparative method to analyze qualitative data from the surveys and game design documents.

Results

Pedagogical Approaches and Strategies

Most participants (75%) applied the constructivist learning approach to the design of their games. A small number of participants (25%) designed educational games using the behaviorist approach. Major engagement strategies used by the participants include creating an avatar, role-playing, real-life situations, fantasy contexts, rewards (e.g., points, stars, power-ups), unlocking new items/areas/levels, and time limit.

In terms of scaffolding strategies, many participants, especially those who used the constructivist learning approach, planned to provide scaffolding using non-player characters (NPC). Other scaffolding strategies used include increasing the difficulty levels, information embedded in virtual resources (e.g., virtual handbook, virtual encyclopedia), pop-ups (just-in-time information), immediate feedback, hints and clues, tutorials, and help.

Perception Changes

The majority of the participants initially viewed digital games as motivational tools. They reported that digital games make learning fun and keep students engaged. After completing the game design assignment, however, they realized that digital games have many other educational benefits. This result showed that the game design experience positively improved their perceptions of the educational value of digital games. T-test results revealed a significant increase in the scores ($t(19) = -2.20$, $p = 0.04$) from pre-survey ($M = 3.75$, $SD = .72$) to post-survey ($M = 4.04$, $SD = .64$) in the category of interest, attitudes, and self-efficacy. This result suggests that the game design experience had a positive influence on the participants' interest, attitudes, and self-efficacy regarding the use of games in the teaching. Initially, 75% were interested in using digital games in the classroom ($M = 3.90$, $SD = 1.07$). After designing their own educational games, all but one of the participants agreed or strongly agreed that they were interested in using digital games in the classroom ($M = 4.25$, $SD = .91$). A Wilcoxon Matched Pairs Signed Rank test revealed a statistically significant difference between self-efficacy scores ("I have knowledge and skills required for using digital games in the classroom") before and after the game design assignment ($Z = 4.50$, $p = .005$).

We found a significant decrease in the scores from pre-survey ($M = 2.17$, $SD = .61$) to post-survey ($M = 1.77$, $SD = .52$) in the category of perceived problems; $t(19) = 4.204$, $p = 0.000$. Further, Wilcoxon tests revealed a significant difference between pre- and post-survey scores on the following two items: "Digital games may draw students' attention but do not help them learn" ($Z = 55.00$, $p = .003$), and "Digital games are not compatible with my teaching style" ($Z = 32.50$, $p = .033$).

Although most participants believed that teachers should be involved in the process of educational game design ($M = 4.15$, $SD = .75$), several participants were initially neutral about teacher involvement in educational game design. After the game design experience, however, all participants agreed or strongly agreed that teachers should be involved in the process of educational game design ($M = 4.55$, $SD = .51$). A Wilcoxon Matched Pairs Signed Rank test showed that the difference between the pre-survey scores and post-survey scores on the teacher involvement item was statistically significant ($Z = 11.00$, $p = .033$).

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